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Arthroscopic Sub-acromial Decompression in Impingement Syndrome of Shoulder – A Clinical Study

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Introduction

The shoulder is the most versatile joint in the body having a wide functional range of motion, including arm elevation to 180°, rotation to 150° and horizontal (sagittal) plane rotation of 170[1, 2]. By combining the coordinated glenohumeral and scapulothoracic motion with contributions from the acromioclavicular and sternoclavicular joints, the shoulder can retain stability without compromising mobility.

Shoulder pain is a frequent complaint; with prevalence in the general population ranging from 70 to 260 per 1000[3, 4]. According to a recent state-of-the-art review, the annual incidence of shoulder disorders is estimated at 7%, its 1-year period prevalence at 50% and its lifetime prevalence at 10%[5]. Of all new episodes of shoulder disorders presenting to primary care, symptoms may persist for up to 1 year in 40% of patients.

It is described as a mechanical impingement of the rotator cuff tendon beneath the antero inferior portion of the acromion, especially when the shoulder is placed in the forward-flexed and internally rotated position[9]. This disorder can present in many forms, ranging from inflammation to degeneration of the bursa and rotator cuff tendons of the subacromial space.

Curved or hooked shape of the acromion, osteophytes under the acromioclavicular joint, subacromial bursitis, thickened coracoacromial ligament, degenerative or a traumatic cuff failure and calcific rotator cuff tendinitis are some of the reasons for impingement of the shoulder.

The underlying causes of rotator cuff impingement may be subdivided into intrinsic disorders of the rotator cuff and extrinsic pressure from the coracoacromial arch. In intrinsic disorders, the tendon is thickened and inflamed at areas of calcification, swollen at the site of partial cuff tears, or covered by a chronically inflamed and indurated subacromial bursa. In extrinsic cases, the shapes of the acromion, the attachment of the coracoacromial ligament and changes in the acromioclavicular joint have been implicated. It is often stated that in most instances overuse of the affected arm is the basic cause of impingement.

Neer CS[18] described the following 3 stages in the spectrum of rotator cuff impingement:

- Stage 1- commonly affecting patients younger than 25 years, is depicted by acute inflammation, edema, and

hemorrhage in the rotator cuff. This stage usually is reversible with nonoperative treatment.

- Stage 2- usually affects patients aged 25-40 years, resulting as a continuum of stage 1. The rotator cuff tendon progresses to fibrosis and tendonitis, which commonly does not respond to conservative treatment and requires operative intervention in the form of open / arthroscopic sub acromial decompression.
- Stage 3 commonly affects patients older than 40 years. As this condition progresses, it may lead to mechanical disruption of the rotator cuff tendon and to changes in the coracoacromial arch with osteophytes along the anterior acromion. Surgical anterior acromioplasty and rotator cuff repair is commonly required.

Non surgical management of subacromial impingement syndrome (SIS) continues to be successful in many patients. The most common interventional modalities include modification of activities, the use of non-steroidal anti-inflammatory medications, subacromial injection of steroids and physical therapy programs[11].

It has been demonstrated that exercise has statistically and clinically significant effects on pain reduction and improving function, but not on range of motion or strength[19].

A systemic review was conducted, aiming to compare conservative versus surgical treatment for subacromial impingement syndrome. The conclusion was that no high quality RCTs are available to provide possible evidence for differences in the outcome; therefore, no confident conclusion could be drawn[21.]

The goal of subacromial decompression is to arrest the inflammatory process and prevent progressive degenerative changes in the soft tissues comprising the subacromial space.

The purpose of present study was to evaluate the functional results of arthroscopic subacromial decompression (ASD) in patients suffering from impingement syndrome of shoulder.

Material and Methods

This was a case series type of study design. A detailed clinical and radiological examination was performed to diagnose impingement syndrome in patients. 30 patients with impingement syndrome of shoulder were taken up for study.

Inclusion criteria

1. Adult patients of either sex with age >16 years with impingement of the shoulder who gave consent for the study.
2. Patients having positive impingement signs.
3. Unimproved pain after a course of conservative treatment.

Exclusion criteria

1. Patients with a stiff shoulder and adhesive capsulitis of shoulder.
2. Patients with glenohumeral osteoarthritis.
3. Patients with glenohumeral instabilities.
4. Age below 16 years.

Patients meeting the inclusion criteria were subjected to clinical examination, roentgenographic examination including antero-posterior and supraspinatus outlet views of the shoulder and MRI of the shoulder. Patients diagnosed with impingement syndrome of the shoulder were taken up for surgery after written informed consent.

Procedure

All patients were operated under general anaesthesia. They were positioned in a lateral decubitus position with the back even with the edge of the table and the affected

shoulder up (Fig.1). Traction of 4-6 kg was applied to the affected limb.

After painting and draping, bony landmarks, including the acromion, distal clavicle, acromioclavicular joint and coracoid process were outlined. A posterior portal was made in the soft spot between infraspinatus and teres minor muscles. The anterior portal was established with the help of wissinger rod after the posterior portal, using an inside-to-out technique (Fig. 2). The glenohumeral joint was examined for status of biceps tendon, status of labrum, synovitis, rotator cuff tears, loose bodies and signs of instability and findings were recorded.

A needle was inserted about 3 cms distal to the acromion in line with the posterior aspect of the acromioclavicular joint. This was the lateral portal and the primary operative portal for the subacromial space (Fig. 3). Bursectomy was performed with the help of motorized shaver to view the superior surface of the cuff out to its attachment to the greater tuberosity. A radiofrequency ablator was used to morcellate the periosteum and the undersurface of acromion, releasing the coracoacromial ligament. After morcellating the soft tissues of the undersurface of acromion, a motorized shaver was placed through the lateral portal to remove the soft tissues from the undersurface of acromion after carefully identifying the anterior, medial and lateral edges of the acromion for a distance of approximately 1.5 cm posterior (Fig. 4). Now a motorized burr was placed through the lateral portal, and the lateral edge of the acromion was resected just medial to the portal, starting at a depth of about 5 mm anterior and tapering posteriorly. After resecting the lateral aspect of the acromion, the anterior cut was begun from anteromedial to the acromioclavicular joint working anterolaterally. The cut was deepened through the anterior edge of the acromion to about 5 mm. Using strokes from anterior to posterior, the acromioplasty was tapered posteriorly, resecting about 5 mm of acromion anteriorly and tapering and smoothing the section posteriorly, removing only minimal bone. A final inspection was made for additional bleeding sites, calcific deposits and rotator cuff status and all findings were recorded (Fig. 5).

Patients were treated with intravenous antibiotics for 2 days and analgesics in the immediate post-operative period. A shoulder immobilizer was given initially. Codman pendulum exercises of the shoulder were started as soon as patient was pain free. Shoulder rehabilitation was started within the first week. Post-operative assessment was performed using the UCLA shoulder rating scale. Patients were followed up at 1 month, 3 months and 6 months and data was collected as per Proforma.

All data were compiled and checked for discrepancies. Analysis was done using paired t – test and Pearson's correlation coefficient.

Results

The present study included 30 patients of impingement syndrome of shoulder in the age group of 16 years and above.

The age of the patients who underwent the study ranged from 18-65 years with the mean age being 40.33 ± 13.45 years (mean ± s.d.). Maximum number of patients, 20 (66.6%) were in the age group of 26-55 years.

Mean duration of symptoms before the patients were taken up for arthroscopic subacromial decompression was 12.23±6.45 months (mean ± s.d.). Most of the patients in the study had duration of symptoms 6-12 months (63.3%).

The mean pre-op acromio-humeral distance was 6 mm with the lowest value being 3 mm and the highest being 10 mm. The mean post-op acromio-humeral distance at 6 months was 8.56 mm with the lowest value being 6 mm and the highest being 15 mm. The mean amount of resection was 2.56 mm.

The mean post-op acromiohumeral distance at 6 months (8.56 mm) was significantly higher (p<0.001) than the mean pre-op acromiohumeral distance (6 mm).

The mean pre-op pain score was 4.20 with the highest value being 8 and the lowest being 1. The score increased by 1.60 in 1 month to reach 5.80 and by 3.13 in 3 months to reach 7.33. The mean post-op 6 months pain score was 7.80. Total increase from pre-op period was 3.60 with the highest value being 10 and the lowest being 4.

The post-op pain score at 6 months (7.80±1.91) was significantly higher (p<0.001) than the pre-op pain score (4.20±2.29)

The mean pre-op function score was 4.80 with the highest value being 8 and the lowest being 2. The score increased by 1.26 in 1 month to reach 6.06 and by 2.86 in 3 months to reach 7.66. The mean post-op 6 months function score was 8.40. Total increase from pre-op period was 3.60 with the highest value being 10 and the lowest being 6.

The post-op shoulder function score at 6 months (8.40±1.77) was significantly higher (p<0.001) than the pre-op shoulder function score (4.80±2.00).

The mean pre-op UCLA score was 15.60 with the highest value being 25 and the lowest being 8. The score increased by 7.66 in 1 month to reach 23.26 and by 12.63 in 3 months to reach 28.23. The mean post-op 6 months UCLA score was 29.90. Total increase from pre-op period was 14.30 with the highest value being 35 and the lowest being 22.

The post-op UCLA score at 6 months (29.90±4.67) was significantly higher (p<0.001) than the pre-op UCLA score (15.60±5.19).

No serious complications were noted. Only 3 of the patients had scar pain and 1 had broken upper incisors as a complication of intubation while administering general anaesthesia.

Discussion

Impingement syndrome of the shoulder is the most common disorder of the shoulder, accounting for 44–65% of all complaints of shoulder pain[6, 7, 8].

The impingement syndrome of the shoulder appears to be largely a clinical diagnosis. There is a wide underlying spectrum of pathoanatomic changes extending from mild inflammation in the bursa to complete rupture of the rotator cuff tendons[18].

The present study comprised of 30 patients with impingement syndrome of shoulder, unimproved after a course of conservative treatment. Patients of both sexes aged 16 years and above were included in this prospective study.

Of the 30 patients in our study, 16(53.3%) were male and 14(46.7%) were female. Males predominated in the study, with the overall male to female ratio being 1.14:1. Thus we can infer that males are more affected because they are usually involved with more overhead and athletic activities.

In our study, dominant shoulder affection was seen in 20 (66.7%) patients. Dominant shoulder affection can be attributed to increased use of the particular shoulder for most day to day activities especially overhead activities.

19 (63.3%) patients in our study had duration of symptoms ranging from 6-12 months. Duration of symptoms ranged from 6-28 months. Mean duration of symptoms before operative intervention was performed was 12.35±6.45 months. It was similar to the studies performed by Gartsman GM [1990][96]:18.7 mo, Roye RP et al [1995][82]:17 mo, and Lim KK et al [2007][89]:12.4 mo.

A highlighting finding in our study was the highly significant negative correlation (p<0.001; R= -0.76) between duration of symptoms and UCLA score at 6 months follow-up. Patel VR et al [1999][84] found that symptoms of prolonged duration were associated with an

unsatisfactory subjective result ($p<0.01$) and with smaller improvements in the parameters of the Constant score ($p<0.001$). They concluded that patients with prolonged symptoms had a significantly poorer outcome after ASD, both functionally and subjectively.

Out of 30 patients included in our study, 28 (93.3%) tested positive for Neer impingement sign. Sensitivity of this test in diagnosing impingement syndrome of shoulder in our study came out to be 93.3%. Park HB et al [2005][99] reported sensitivity of this test as 68%. It is a highly sensitive test, thus useful for screening purposes.

29 (96.7%) patients tested positive for Hawkins Kennedy test in our study. Thus, sensitivity of this test in diagnosing impingement syndrome of shoulder was 96.7%. Park HB et al [2005][99] reported sensitivity of this test as 71.5%. Therefore, we can conclude that a combination of these two tests is a very useful screening tool for impingement syndrome of shoulder[100]. Specificity of these tests could not be determined in our study as there were no true negatives and false positives.

In our study, 25 (83.3%) patients had type 2 acromion, 5 (16.7%) patients had type 3 acromion while none of the patients showed a type 1 configuration. This distribution of population according to type of acromion was similar to the study conducted by Lim KK et al [2007][89] where there were 12% patients with type 2 acromion and 88% patients with type 3. Moreover in our study, 3 out of 4 patients (75%) with partial or full thickness rotator cuff tear showed a type 3 configuration of acromion. It is widely accepted that rotator cuff lesions are noticed mainly in the hooked acromia (62–66% of the cases of rotator cuff rupture involve the type 3 acromion) [101, 102, 103]. This correlation is explained by the reduction in the dimensions of the subacromial space in the hooked acromia, which more often leads to impingement of the rotator cuff. This explanation, however, is a matter of debate. There is the question of whether the hooked shape is a congenital feature or represents a degenerative change by which type 1 is converted to type 3 in the course of time[104, 105].

In our study, mean pre-op strength score was 4.06 with the highest value being 5 and the lowest being 2. The score increased by 0.54 in 1 month to reach 4.60 and by 0.60 in 3 months to reach 4.66. Mean post-op 6 months strength score was 4.76 with 4 meaning full ROM against gravity with moderate resistance and 5 meaning full ROM against gravity with maximum resistance. Total increase from pre-op period was 0.70 with the highest value being 5 and the lowest being 4. In the study by Ellman H [1987][75] pre-operative strength was recorded as an average of 4.6; post-operatively, a negligible improvement to 4.8 was noted. The average strength of forward flexion score changed from 3.4 (fair) pre-operatively to 4.6 (good) 1-2 years post-operatively in the study conducted by Esch JC et al [1988][76]. There was no indicative change in shoulder strength in the study conducted by Ellman H et al [1991][78]. The mean follow up strength of forward flexion score for the UCLA scale was 4.5 in the study by Lim KK et al [2007][89]. The post-op strength of flexion score at 6 months (4.76 ± 0.43) was significantly higher ($p<0.001$) than the pre-op strength of flexion score (4.06 ± 0.90) in our study.

83.3% of our patients had poor UCLA score with only 16.7% having fair score at the beginning of the study. At the end of 6 months period, 26.6% patients scored excellent, 36.7% scored good, 36.7% had fair score and none had a poor score. Our results were similar with the study conducted by . Lim KK et al [2007][89] in which 33% patients obtained an excellent score, 50% scored good, 10% fair and 7% poor score.

Arthroscopic subacromial decompression is a tool that has been validated with symptomatic and functional

improvement in both short and long-term, for patients with isolated SIS. Apart from the lessened surgical morbidity, one of the main advantages of the arthroscopic procedure compared to the open procedure is the ability to directly visualize the glenohumeral joint. Glenohumeral arthroscopy is particularly important to rule out other abnormalities and to effect appropriate treatment. Another advantage of arthroscopic procedure is that the rehabilitation can be quicker compared to the open procedure.

The limitations of the study include:

- The study sample could have been larger.
- The duration of the study and follow up could have been longer.

Conclusion and Recommendations

On analyzing the below mentioned points it can be concluded that arthroscopic subacromial decompression is an effective and safe method for treatment of selected patients with impingement syndrome of shoulder.

- Those patients who had failed a course of conservative treatment were benefitted by the procedure.
- Patients with a lesser duration of symptoms benefitted more from the procedure.
- Almost all patients experienced rapid relief in pain with an accompanying improvement in function, strength of forward flexion and range of motion. Almost 93% patients reported that their symptoms had improved and that they were feeling better and satisfied.
- Duration of procedure was short.
- The cost of undergoing treatment was low as no implants were used.
- Patients were able to return to activities of daily living within a few days.
- Number of days absent from work was less as patients returned to normal activities soon and were discharged a day after surgery.
- Intra and post-operative complications were few and insignificant and morbidity was minimal.
- A larger study including more number of cases and a longer duration of follow-up would be helpful in strengthening our conclusions.

Thus we can conclude that, arthroscopic subacromial decompression is an excellent surgical treatment for impingement syndrome of shoulder in selected patients resistant to conservative management.

We recommend the use of arthroscopic subacromial decompression in all patients with stage 2 impingement syndrome and selected patients with stage 3 impingement syndrome who are resistant to a course of conservative treatment, as an outpatient procedure for quicker and effective pain relief and rehabilitation.

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